ICE CREAM
PRODUCTION GUIDE

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By

N. E. OLSON

and

N. R. GOTTHOFFER

of the

Technical Service Staff

of

GRAYSLAKE GELATIN CO.

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Introduction

IN PRESENTING *this digest to the ice cream trade, the Grayslake Gelatin Company hopes that it will prove helpful to the ice cream maker in solving some of the problems with which he is frequently confronted. We believe it embodies the best practices now in use. No attempt has been made to cover certain of the more technical phases or the results of unproved or controversial research.*

It is an accepted fact that the closer the ice cream maker holds to a simple, balanced mix, properly processed, frozen and handled, the surer he will be of obtaining a high quality, economically produced product.

ICE CREAM

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Section A—INGREDIENTS

1. Butter Fat

There are three principal sources of butter fat for ice cream—sweet cream, frozen cream, and unsalted butter. High quality, fresh, sweet cream is naturally the superior product to use, but in times of shortage it is often necessary to use cream of high fat content which has been frozen and stored during a period of plenty. It is desirable that such cream be sweetened before freezing, 10% sugar being normally employed. Sugar improves the keeping quality of such cream and, to a certain extent, prevents the breaking of the emulsion. The principal objection to the use of frozen cream is that frequently it possesses an oxidized or metallic flavor which is not readily apparent until incorporated in the mix. However, if the cream is of good quality, an excellent product will result. Unsalted butter when used should be of high quality, free

from any off-flavors. Unless care is exercised in the processing of a mix prepared from frozen cream or butter, a mix of high viscosity and poor whipping qualities may result.

Fat in ice cream varies between 8% and 18%, but probably the greatest volume falls in the neighborhood of 12% fat. The percentage of fat to use is dependent upon state laws, the type of business conducted, and consumer preference. Ice cream containing lower than 8% fat lacks the cream flavor which is so desirable in ice cream, while fat content much in excess of 14% produces ice cream which may be too rich for the average consumer.

II. Serum Solids—Milk Solids Not Fat

The properly balanced ice cream mix has the serum solids content built up by the addition of some form of concentrated milk. For this purpose skim milk powder, plain condensed milk, and sweetened condensed milk are available. Good ice cream can be made with any of these materials, assuming of

course, that they are all of equally good quality. However, it must be borne in mind that milk products, even though efficiently pasteurized and concentrated, develop a stale flavor if kept too long.

The reason for increasing the serum solids content of ice cream is to add to the food value and to assist in the production of good body and texture. Serum solids also serve to improve the whipping qualities of the mix by functioning as a foaming agent and in preventing clumping of the fat globules during homogenization. The percentage of serum solids to use will vary according to the fat content of the mix, but in no case should this percentage exceed the percentage of fat, since a serum solids flavor rather than a cream flavor will result. Generally speaking, from 10% to 11% of serum solids is used with 12% of fat, while with 14% fat the normal amount is 9% to 10%. Serum solids content in excess of 11% may cause sandiness to develop in the finished ice cream, particularly in nut ice creams. A number of low lactose milk solids

are available which do not produce sandiness, but some of them do impart an undesirable flavor to the ice cream.

Sandiness is the result of crystallization of milk sugar caused by excessive serum solids and is influenced by a number of other factors.

III. Sugars

The usual sugar content used in ice cream is between 13% and 15% though larger amounts up to 16% and 17% are used in the higher fat ice creams. Either cane or beet sugar produces equally good results and may be used interchangeably. The percentage of sugar to use will depend primarily on consumer preference. However, sugar is a valuable solid and has much to do with producing ice cream of desirable body and texture, and therefore, as much as possible should be used consistent with the likes of the trade and the conditions under which the ice cream is to be sold. Sugar is the principal ingredient in ice cream affecting the freezing point. Therefore, excessive

sugar content may cause difficulties in freezing, hardening, and storage and may result also in decreased heat resistance.

Some manufacturers replace a part of the cane sugar with corn sugar in order to increase the solids of the mix without producing an ice cream of excessive sweetness. Since corn sugar is a simple sugar it is more readily assimilated, but since it depresses the freezing point more than cane sugar, difficulties may be encountered with freezing, storage, and dispensing. Lower temperatures will have to be kept throughout all operations if equal firmness and texture are to be maintained. In any event, not over a 25% substitution of corn sugar for cane sugar is desirable.

IV. Stabilizers

1. Stabilizers are used in ice cream to protect properly manufactured ice cream from the heat shocks of transportation, handling, and dispensing. Their purpose is to retard the growth of ice crystals, thus preserving the smooth texture. They should not be used as

fillers to cover up a deficiency of milk solids or as a prop for excessive overrun. While gelatin has an influence in the production of good texture, it should not be used as a means of producing good texture; that is the function of proper composition, processing, freezing, and hardening, together with judicious handling of the finished product.

Since ice cream is a high quality food product recommended for the sick or very young as well as for the healthy adult, it is advisable to employ only high quality, pure food stabilizers. A satisfactory stabilizer for ice cream should produce a smooth-textured, firm-bodied ice cream of good dipping and melting characteristics. It should afford reasonable protection against the growth of ice crystals. In itself it should be a fine food product. Only high grade gelatin meets these specifications.

Periodically various substitute stabilizers are offered to the trade but none have stood the test of commercial conditions. Most of these add body to the ice cream but are not

effective in preventing ice crystal growth. Lower storage and dispensing temperatures are necessary for equal firmness. Some of them produce shrinkage, some bad melting conditions, and still others, separation of the liquid and solids of the mix. None of them, with the exception of starches, possesses food value. Some affect even the flavor of the ice cream. The real test of a stabilizer's ability to prevent the growth of ice crystals and the resultant deterioration of texture is to examine the ice cream after several days' exposure to the variable conditions found in the average ice cream storage cabinet. Ice cream of good composition, properly processed, frozen and hardened will have good texture when fresh without stabilizer of any kind, but during storage, coarseness will develop rapidly in such unstabilized ice cream.

2. The function of gelatin in ice cream is

(a) to retard the growth of ice crystals and loss of smooth texture during storage, transportation, and dispensing,

(b) to aid in producing good body and

smooth texture,

(c) to increase resistance to melting and improve the melting appearance of ice cream,

(d) to assist incorporation of air in a finely divided state.

3. While performing the above functions, gelatin

(a) increases food value and facilitates digestion,

(b) reduces shrinkage; ice cream containing gelatin will retain air much longer than ice cream with no gelatin,

(c) tends to reduce loss of volume on dipping.

4. The correct amount of gelatin to use in the mix will depend on the following factors.

(a) The jelly strength of the gelatin and its water absorbing qualities. High test gelatin will be found to be the most economical.

(b) The composition of the mix. As the fat and total solids of the mix increase, the quantity of gelatin necessary decreases because of the smaller amount of water and the

fact that higher solids in themselves have certain stabilizing value.

(c) The method of processing. Within small limits less gelatin can be used with higher homogenizing pressures.

(d) The freezing methods. The more efficient the freezing methods, the less gelatin is needed. Properly frozen ice cream has small initial ice crystals and will, therefore, require less of the protective action of gelatin.

(e) Overrun. If this is much in excess of 100%, more gelatin should be employed.

5. Ice cream makers sometimes have the impression that gelatin increases the whipping ability of the mix, but this is incorrect. If too much gelatin is used, difficulty will be encountered in obtaining the desired swell and increased whipping time will be necessary. Consequently, the ice cream is drawn from the freezer at a temperature higher than is desirable and a coarse textured product may result, whereas the correct amount of gelatin would have yielded a product of smooth texture.

In short, it is a mistake to assume that whipping or texture difficulties are due to an insufficient amount of gelatin before investigating the factors of proper processing and freezing. To add more gelatin may increase the trouble when less gelatin would cure it. The correct amount of gelatin produces ice cream which melts to a creamy fluid.

V. Egg Yolk

Egg yolk is used primarily to improve the whipping qualities of the mix. This is especially true in mixes compounded from frozen cream or butter. Egg yolk adds to the food value of the mix, but in the quantity normally employed (0.3% to 0.5%, dry basis), it is doubtful that it has much effect on flavor or color. Necessarily a true custard ice cream contains considerably more egg yolk.

Egg yolk is not necessary to produce a fast whipping mix, if proper processing and modern freezing methods are employed. Mixes containing egg yolk acquire an artificial stiffness or dryness at the freezer with the

attendant danger that the ice cream may be drawn at a higher temperature than desirable, thus impairing the texture of the finished product. On the other hand, if the freezer is a slow whipping machine, egg yolk will hasten the attainment of the desired overrun, making it possible to draw the ice cream at a temperature lower than would be possible otherwise and the result is a finer textured product.

Egg yolk is available in three forms: frozen, dried, and fresh egg yolks. These products, if they are in good condition, are of equal value, but the amount to be used successfully must be calculated on the basis of the dry solids content. Approximately twice as much frozen or fresh yolk as of the dried product should be used.

Frozen yolks should be prepared with 10% sugar before freezing to retard the separation of lecithin and the impairment of their emulsifying properties.

VI. Improvers

So-called improvers are usually composi-

tions containing a coagulating enzyme, such as rennet or pepsin, mixed with starch or powdered sugar or both. They are seldom used at the present time. Since the enzyme continues to work even after the ice cream is frozen, the ice cream tends to shrink away from the walls of the container while in storage.

Section B—PROCESSING

I. Compounding the Mix

The proper method of compounding an ice cream mix is first to place all cold liquid ingredients in the vat. Gelatin is then added by simply sprinkling the dry gelatin into the cold liquid milk and cream. If the liquid ingredients are warm, it is desirable to mix the gelatin with a small amount of sugar to prevent lumping. Milk powder, if of good solubility, can be added in the same manner. Powdered egg yolk is incorporated more readily if mixed with a small amount of sugar. Frozen egg yolks should be thawed

and beaten with a quantity of milk or cream before being added to the vat. Some plants put this mixture through the homogenizer before adding to the mix. Sugar, because of its ready solubility, may simply be poured into the vat. Efficient agitation should be present to prevent the sugar from falling to the bottom of the vat and forming a cake. This later causes excessive wear on the homogenizing valves.

II. Standardizing Acidity

No sour or high acidity dairy products should be used in the production of quality ice cream. It is possible to neutralize the acidity, but the sour flavor and odor cannot be covered up. However, most modern plants find it desirable to standardize the acidity of the mix to about 0.2% acid as determined by the standard Mann acidity tester, in order to produce a mix of uniform physical properties and good whipping ability. Mixes high in acidity, though still sweet in flavor, tend to develop excessive viscosity and poor whip-

ping qualities after homogenizing. Bicarbonate of soda (baking soda) has been found to be the most desirable alkali for the purpose of standardizing the acidity. Lime never should be used because calcium salts tend to produce slow whipping mixes.

III. Pasteurizing

Most ice cream factories have found it desirable to pasteurize the entire ice cream mix at not less than 150° F. for thirty minutes; some even go to 165° or 170° F. Besides having a lower bacteria count, the mix is improved in whipping quality as a result of high temperature pasteurization. No appreciable cooked flavor will result if the pasteurizer is equipped for efficient circulation and if there is not too great a temperature differential between the mix and the heating medium.

IV. Homogenizing

1. Purpose.

Primarily homogenization serves to break

the comparatively large fat globules of the butter fat into a large number of very small globules which will not churn in the freezer. The process also thoroughly emulsifies the mix and, if done under proper pressures and conditions, produces a mix of good whipping quality and ice cream of superior body and texture. Homogenization also enhances the apparent richness of the ice cream.

2. Homogenizing Temperature and Pressure.

Homogenization should always take place at pasteurizing temperature. If the temperature is lowered, excessive viscosity is produced and a slow whipping mix results. The pressure to be employed will vary according to the composition of the mix, depending mainly on the fat content. This pressure should not be high enough to produce excessive viscosity, which is caused by the clumping of the fat globules. Generally speaking, the following pressures have been found to be satisfactory:

10% fat—3,000 pounds
12% fat—2,500 pounds

14% fat—2,000 pounds
16% fat—1,500 pounds

Two-stage homogenizers are sometimes employed to break up any clumps of fat globules which may be formed during the first stage. Efficiency of homogenization is shown practically by the whipping ability of the mix and the absence of butter particles in the finished ice cream. Efficiency may be determined in the laboratory by examination of the mix under a microscope to determine the relative size and distribution of the fat globules.

3. Condition of the Homogenizer.

Since, from the standpoint of mix processing, the homogenizer is the most vital piece of equipment in an ice cream factory, it must be kept in efficient operating condition to produce proper results. Too often the homogenizing valve is neglected until it becomes so badly scored with radial grooves that it cannot possibly perform regardless of the pressure used. Valves should be inspected frequently and reground when necessary to

maintain a perfect seat. Often the gauge, especially where the common spring type gauge is used, is inaccurate. At times, particles may get through the strainer or packing may be sheared off by the plungers and become deposited under the seat of the homogenizing valve. This will cause fluctuation of the gauge hand and should be remedied immediately by stopping the homogenizer and removing the offending material. Homogenizers should be completely disassembled and washed immediately after each use for sanitary reasons and likewise to prevent milk products caking on the valves thus impairing efficiency.

V. Aging and Storage of the Mix

The purpose of aging is to promote the whipping ability of the mix and to improve the body and texture of the ice cream.

The preferred practice is to pass the mix from the homogenizer over a cooler and cool immediately to a temperature as low as possible without freezing the mix. In storage, a temperature below 40° F. should be main-

tained at all times. The old practice of aging the mix from twelve to twenty-four hours before freezing is no longer necessary. Modern methods of balancing the mix and of processing make it possible to get perfect results after three or four hours of aging at low temperatures.

VI. Freezing

1. In the two types of freezers, batch and continuous, either brine or direct expansion freezing is employed. No attempt will be made here to discuss the relative merits of these various types of freezers. For best results, however, freezing should be accomplished in not over four minutes on batch freezers and the whipping time should not exceed three or four minutes additional. It is possible to complete a batch in 5 to 6 minutes in the newer type of direct expansion batch freezers. When a longer time of freezing is necessary, the equipment is at fault. In the case of the brine freezer too high brine temperature or insufficient quantity of brine

is indicated; in the case of the direct expansion freezer the trouble may be in too high suction pressure or lack of sufficient liquid ammonia. Slow freezing may be caused also by twisted dashers or by dull blades which fail to keep the cylinder wall properly scraped.

Freezing should be carried to a temperature as low as possible consistent with the ability to obtain the desired overrun. If ice cream is over-frozen, it will have to warm up before the air can be incorporated. However, with modern direct expansion batch freezers it is possible to freeze to 23° or 24°. If whipping is then accomplished in a normal length of time, it should be possible to draw the ice cream from the freezer at 24° to 25°. At this temperature ice cream "ribbons" and "piles" and has a rather dry appearance. With the old style batch brine freezers it is not possible to get this temperature much below 27°, though with modern brine freezers using brine temperatures below —10° F., equally good results may be obtained as with the direct expansion freezers. With the continuous

freezer it is customary to draw ice cream at a temperature around 22° F. It is well understood that the lower the temperature of the ice cream when it leaves the freezer, the more water will have been frozen under agitation in the freezer, and hardening will take place much faster in the hardening room. These factors tend to produce small ice crystals and consequently, finer textured ice cream.

To insure uniformity, the ice cream should be sampled and weighed before drawing from the freezer. After freezing, the ice cream is transferred to the hardening room as quickly as possible; this is particularly necessary in the case of package goods.

2. Overrun or Swell.

(a) Overrun is defined as the increase in volume of the ice cream over the volume of the mix, expressed as per cent of the volume of the mix. Overrun is obtained as a result of incorporation of air in ice cream by whipping. It is necessary to give proper body, texture, and palatability to the finished product; it is not to be regarded as desirable

simply because it increases volume and thereby lowers cost. Every experienced manufacturer obviously realizes the necessity of obtaining an overrun as high as possible consistent with quality since it is an important factor in the cost of the finished product.

(b) When slow whipping or inability to obtain the desired swell is encountered, a mix of excessive viscosity is usually the cause of the difficulty. In all the preceding sections, the emphasis has been on producing a mix of low viscosity and consequently, of quick whipping ability. Any factor which tends to produce excessive viscosity will decrease the whipping ability of the mix.

(c) Difficulty in obtaining overrun may be caused also by slow freezing, overloading the freezer, freezers of faulty construction, or lack of proper dasher speed caused by slipping belts or low electric voltage.

VII. Hardening and Storage

Hardening of the ice cream should be accomplished as rapidly as possible to prevent

the growth of ice crystals while in this semi-frozen stage. The hardening room should be kept at a temperature of —10° F. or lower, and fan circulation is desirable.

Since quick hardening is so essential, space should be left between packages to permit better circulation. If the coils of the hardening room are allowed to become heavily encrusted with frost, efficiency of the coils will be materially reduced and hardening time increased. Effort should be made to avoid variations of temperature in the hardening room, because heat shocking tends to cause the development of large ice crystals, and it is also a factor in the development of sandiness.

Section C—THE PRODUCT (Ice Cream Defects)

I. Coarseness

1. Coarse texture may be caused by—

(a) Improperly balanced mix composition or too low total solids content.

(b) Not enough or too much gelatin.

(c) Certain gums used as stabilizers.

(d) Improper processing, including

Too low homogenizing pressure

Insufficient aging

Too slow or insufficient freezing

Too slow hardening

Faulty condition of homogenizer or freezer parts

Drawing at too high temperature due to slow whipping.

(e) Too much overrun.

(f) Repeated heat shock. Temperature fluctuations in the hardening room should be avoided.

II. Sandiness

1. Sandiness is due to crystallization of lactose (milk sugar) in the mix.

2. Sandiness is favored by—

(a) Excess (over 11.5%) of serum solids.

(b) Heat shocking or temperature fluctuations.

(c) Too long storage or too high tem-

peratures during storage and dispensing.

(d) The use of condensed milk in which crystallization has already started.

(e) Slowness in freezing, whipping, and hardening.

(f) Solid particles which absorb lactose on the surface. Nuts or other solid particles act as nuclei for the formation of crystals. They also absorb a certain amount of water from the mix, thus making it more concentrated. Less water is therefore available for the lactose. Washing nut meats before adding to the mix will correct this condition.

III. Soggy Body

1. Soggy body is caused by
   (a) Too high solids.
   (b) Too much gelatin.
   (c) Too much filler.
   (d) Too little overrun.

IV. Crumbly Body

1. Crumbliness is due to
   (a) Improper standardization of the mix.

(b) Low total solids content.

(c) Not enough gelatin.

(d) Too low homogenizing pressure or incomplete homogenization—especially with a high fat mix.

V. Buttery Ice Cream is caused by inefficient homogenization

VI. Curdled appearance on melting

1. Curdled appearance on melting is a result of

(a) Improper salt balance as the principal factor. Excess calcium favors curdling while excess citrates or phosphate salts such as sodium citrate or disodium phosphate favor a smoothly melting ice cream.

(b) Use of improvers.

(c) Use of certain vegetable stabilizers.

(d) Low pasteurizing and homogenizing temperature.

(e) High initial aging temperature.

VII. Shrinkage

1. The following factors all tend to favor

or cause shrinkage:

(a) High overrun.

(b) Excessive acidity.

(c) High storage temperature and long storage time.

(d) Excessive viscosity of the mix.

(e) High serum solids.

(f) Heat or mechanical shocks.

(g) Use of improvers containing enzymes.

(h) Use of gums as stabilizers.

(i) Too high brine temperature.

(j) Drawing too soft from the freezer.

(k) Use of too much corn sugar.

VIII. Flavor Defects

1. The following flavor defects are listed together with their common causes.

(a) Sour—sour milk product. Inadequate pasteurization or poor storage. Lack of sanitation.

(b) Metallic—rusty equipment—too long storage in cans—or copper contamination.

(c) Tallowy—a result of fat oxidation

which is hastened by the presence of small amounts of copper or iron in the mix. Frozen cream especially may impart this flavor to ice cream.

(d) Stale—too high serum solids—use of old dairy products—too long storage before freezing. Favored by excess neutralization.

(e) Saline—high serum solids nearing sandiness.

(f) Rancid—ingredients stored for too long a period. Favored by air, light, heat—excess neutralization.

(g) Cooked—too high pasteurizing temperature—excess use of evaporated or condensed milk.

(h) Surface Taint—due to exposure in the hardening room. Closed containers should be employed.

(i) Medicinal or Chemical—inadequate rinsing after chemical sterilization of equipment. Use of certain extracts.

(j) Foreign or Off Flavor—traced to ingredients generally or to flavors used. Vegetable stabilizers or improvers may be

responsible, tending to mask the real flavor. Poor grade of gelatin may also be a factor.

(k) Feed Flavor—direct from the cow. Can be reduced or remedied by removing cows from pasture several hours before milking.

ICES AND SHERBETS

ICES AND SHERBETS

I. Ingredients and Composition

1. Composition

Ices consist essentially of sugar, fruit juice, and water with color, flavor, and a stabilizing agent added. Fruit acid (citric or tartaric) is also added to give the desired tartness. Sherbets are ices in which part of the water has been replaced by a milk product—such as milk, cream, or ice cream mix. Ice cream mix is usually used.

A good suggested sherbet formula contains from 33% to 35% sugar. For a 34% sugar mix add 6.75% of an ice cream mix containing 12% fat. Acidity should be adjusted to 0.4% to 0.45% by adding 0.50% to 0.55% citric acid.

2. Sugars

The less sugar used the more ice cream mix or stabilizer is needed to obtain a

good product. Corn sugar, employed on the basis of 20% to 25% of the total sugars, helps prevent crystallization and also aids the stabilizer in preventing bleeding. Invert syrup and glucose also are aids in preventing bleeding. Excess corn sugar must be avoided in a high sugar content mix as it may lower the freezing point too much.

3. Stabilizers

Gelatin is the best stabilizer for ices and sherbets if properly incorporated. It is a nutritious food and does not alter the flavor of the product, while it efficiently performs the functions required of it.

When gelatin alone is used as a stabilizer, difficulty is sometimes encountered in controlling the overrun. This tendency, however, is not encountered with quick freezing in the modern direct expansion freezer. In old slow freezing machines the difficulty can

be overcome by running half batches with the brine as cold as possible.

Gums used alone as stabilizers for ices and sherbets are likely to cause a crumbly body and also are productive of non-uniform results. Some gums cause an off-flavor to be produced, low grade gums particularly yielding a flat insipid flavor. Stickiness also may be a by-product of the employment of some gums. Gums and agar are difficult to incorporate; agar must be boiled in fifty times its weight of water to effect solution.

II. Processing and Freezing

1. Aging Mix and Dissolving Gelatin

While some claim that aging of ices and sherbets is unnecessary, others insist that the basic mix (water, sugar, and gelatin) should be aged for four hours below 40° F. before freezing. If the basic mix is pasteurized, gelatin may be incor-

porated in the same manner as in an ice cream mix. When the mix is not pasteurized care must be exercised to insure thorough solution of the gelatin. Soak the dry gelatin in a part of the cold water—two quarts of water for each 4 to 6 ounces of gelatin will be found to be sufficient—for five minutes and then heat to 150°-160° F. Add the gelatin solution thus formed to the balance of the mix with vigorous stirring. If added while too cool or too rapidly and with insufficient agitation, the full colloidal value of the gelatin is not realized.

2. Freezing and overrun

Fast freezing is as desirable for ices and sherbets as for ice cream and the product should be frozen until it will pile. Overrun is one of the most important features in ices and sherbets. It is essential to suppress and to avoid excess overrun in order to obtain a product of the desired consistency. For water ices 25% overrun

is recommended; for sherbets the overrun should be higher but should not exceed 40%. Excessive overrun results in a snowy product with a crumbly body and also one which is too soft. Too much agitation will result in excessive overrun. Slow dasher speed or removing the beater from the dasher reduces overrun.

III. The Product. Defects and Remedies

1. Sherbets and water ices are subject to a number of difficulties not encountered in ice cream. These are—

(a) *Bleeding*. Bleeding consists of the separation of syrup to the bottom. It is caused by—

(1) Poor or insufficient stabilization.

(2) Too high overrun for the amount of solids present.

(3) Too high sugar content. This results in a high sugar concentration yielding a syrup which is difficult to freeze and which separates out in storage.

(4) Too high storage temperature. The higher the sugar content, the lower must be the hardening and storage temperature.

(b) *Crusting*. Crusting consists in the crystallization of sugar; it may be largely eliminated by using 25% corn sugar. The factors causing crusting are—

(1) Too low storage temperature.

(2) Tearing parchment paper from tops of cans, thus exposing surface for drying.

(3) Mechanical shocks, such as,

(aa) Pressure on top.

(bb) Sudden jarring.

(cc) Dishing out portion and letting rest stand.

(c) *Hard Spots* are similar to crusting or surface crustation. They are likewise a result of sugar crystallization.

(d) *Crumbly Body* is caused by the use of insufficient stabilizer or by use of gum alone as stabilizer. Too low

sugar content and excessive overrun also cause crumbly body.

(e) *Hard Body* is due to insufficient sugar or too low overrun.

(f) *Snowy Body* is the result of too much overrun.

(g) *Sticky Body* is the result of using too much stabilizer especially when gums or agar are employed.

(h) *Coarse Texture* indicates that

(1) Not enough stabilizer was used.

(2) Not enough sugar was used.

(3) Drawing temperature was too high.

FACTS ABOUT GELATIN

FACTS ABOUT GELATIN

GELATIN is one essential and valuable ingredient of many prepared foods about which frequently mistaken ideas persist. Those interested in the subject of gelatin should have sound reasons for their opinions; it is for them that this article is submitted.

From the beginning of its long and successful history, Grayslake has been constantly the leader in introducing and maintaining top standards in every aspect of its production. The resulting advancement in colloidal chemistry and food technology and the experience gained in the manufacture and distribution of only Super-Quality Gelatin, the Grayslake trade-mark, suggest this contribution on

(1) What good gelatin is,

(2) What official standards control or affect its manufacture and distribution,

(3) What production methods are necessary to maintain such standards,

(4) How anyone interested primarily in high quality may assure himself that he is using only the best gelatin that is produced.

We assume the prevalence of general knowledge concerning the gel action of gelatin and its nutritional value as a protein food similar to lean meat and white of egg. Its ready digestibility is unquestioned in that it is assimilable almost 100% in the human digestive process. In its classification as a "protective colloid," pure gelatin is especially valuable in stabilizing other food materials. It prevents the breaking up of emulsions and therefore acts as a safeguard or a stabilizing agent.

Because of the wide field covered in the general use of the word gelatin, the United States Department of Agriculture, through the Food & Drug Administration, has imposed the following specification:

"Food gelatin should be prepared under sanitary conditions and should be clean, sound, and free from odor. It should not contain glue or any

other gelatin-like material having a low gelatinous power and a disagreeable taste or smell. It should be free from preservatives, metals and salts of metals, which may render its use dangerous to health."

Gelatin, as a food, shall be deemed adulterated,

"If it consists in whole or in part of any filthy putrid, or decomposed substance, or if it is otherwise unfit for food; or if it is, in whole or in part, the product of a diseased animal or of an animal which has died otherwise than by slaughter."

The great majority of the separate states in their own Food and Drug Regulations have amplified this definition by further restriction as is typical in the case of Connecticut where,

"Edible gelatin is the purified, inodorous product of the hydrolysis, by treatment with boiling water, of certain tissues as skin, ligaments, and bones from sound animals, and contains not more than two per cent (2%) of ash and not less than fifteen per cent (15%) of nitrogen. It should not contain excessive amounts of metallic impurities. A hot water solution of gelatin should be clear and without offensive odor."

Grayslake Gelatin has consistently retained its position well above these federal and state standards. In addition, the American Medical Association has attested to its high quality after the Council on Foods investigated the raw materials and the processing methods.

The raw material used in the manufacture of Grayslake Super-Quality Gelatin is the frozen, edible, fresh porkskin taken from animals slaughtered only for human consumption. These skins are thoroughly cleaned at the meat packing plants, inspected and stamped as Pure Food by the inspectors of the United States Bureau of Animal Industry, frozen and shipped in refrigerator cars to the Grayslake factory where they are placed in cold storage until used.

The processing begins with thawing these skins in tanks of running, filtered water. The skins are then conveyed to aluminum cooking kettles and covered with hot distilled water which forms and extracts the gelatin solution. Distilled water is used throughout the cooking process to avoid the absorption

of dissolved mineral matter, and in the kettles the temperature is carefully and constantly controlled. Drawn off and filtered through aluminum presses, the gelatin solution, a crystal clear fluid, is passed into stainless steel storage tanks ready for cooling. It is then spread and cooled on a special white rubber belt of regulated speed and inclination, and as the solution congeals, it is automatically cut into pieces and placed on nickel screen drying racks. Final drying is accomplished by exposure alternately to cool and hot air constantly conditioned for cleanliness, moisture, etc. The resulting sheets of dried gelatin are then crushed into flakes and granulated to required fineness.

High standards of quality are constantly maintained by testing completely each batch of gelatin in the laboratory. Since all steps in the manufacturing process are automatically controlled, no human hands ever touch the product; all equipment coming into contact with the gelatin solution is clean, white rubber, aluminum, nickel, or stainless steel. The

plant throughout is maintained in the strictest possible sanitary condition by having all equipment thoroughly cleaned with live steam and boiling water before every batch operation.

The following is a proximate analysis of Grayslake Gelatin:

	per cent
Moisture	10.0
Ash	0.3
Fat (ether extract)	0.0
Protein (N x 5.55)	89.7
Carbohydrates	0.0

	Parts per million
Arsenic	0.0
Copper	Less than 10
Zinc	Less than 10
Lead	0.0
Sulphur dioxide	0.0
Added preservatives	None
Calories	3.59 per gram 102.0 per ounce

Micro-Organisms—Bacillus coli, liquefying bacteria, and gas forming bacteria are absent.

Tests

In making comparisons for identifying a superior gelatin two factors, equally important, should be considered by every potential user of gelatin. The first factor is gel strength or stabilizing power, and the second is purity. Reliable testing need not be a complicated procedure as will be proved by using the following methods:

Fill ordinary water glasses about three-fourths full of clear, cold water at about 50° F., and into each pour three teaspoons of the individual gelatins to be compared. The superior gelatin is indicated by the speed and completeness with which the water is absorbed.

Now place the glasses in a pan of hot water and dissolve the gelatins. Note the odor of the hot solutions in each case and determine whether it is agreeable or disagreeable. At the same time it is possible to observe the comparative clarity, color, and cleanliness of the solutions by holding them up to the light. For fine distinctions, holding a portion of a printed page behind the glasses will permit

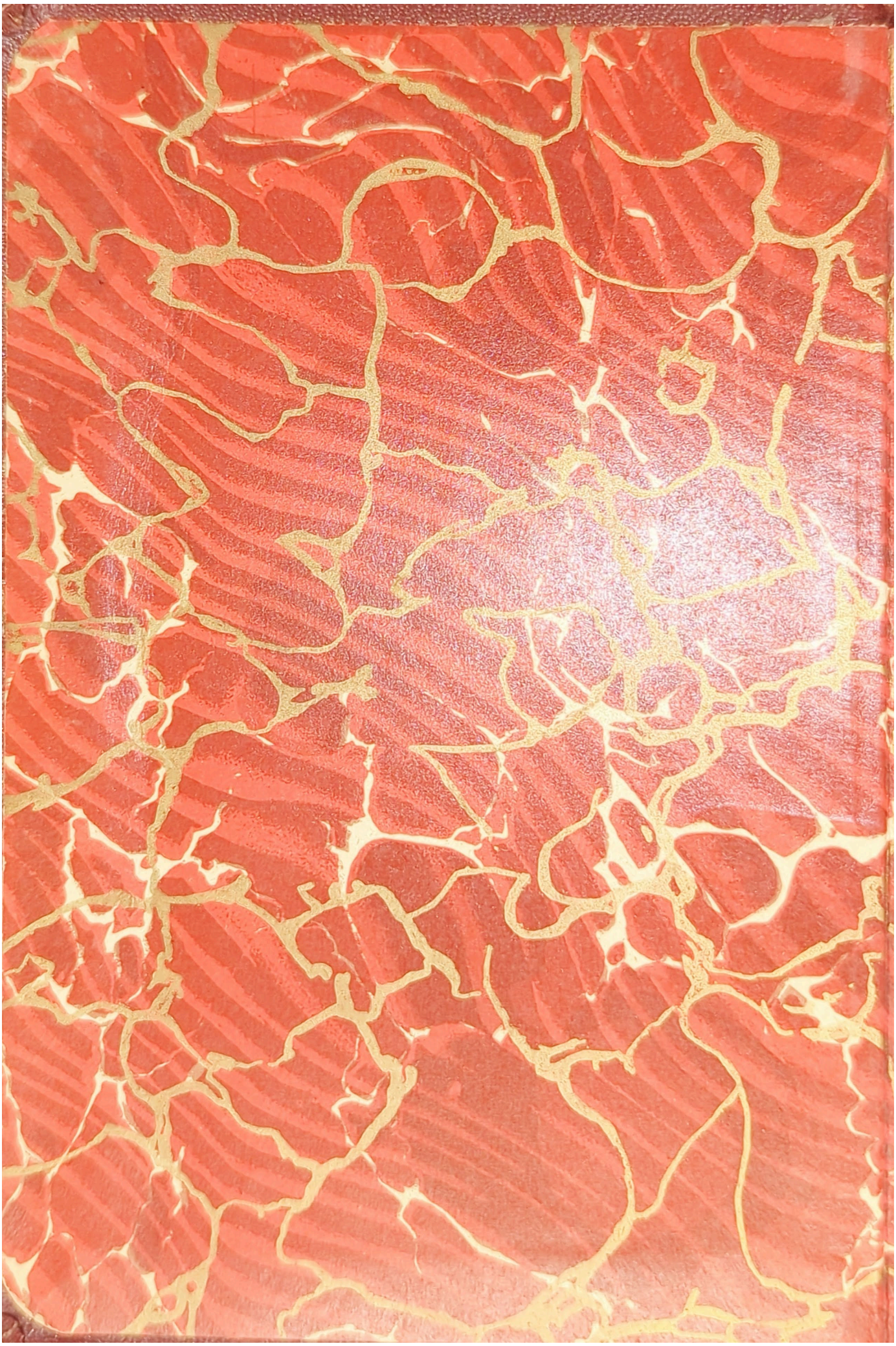
reading with varying degrees of ease and emphasize the clarity of the best. Then observe the free-foaming or natural globule-forming action of the several gelatins; a pure gelatin will foam freely and maintain a stable foam.

Stir all the solutions well and place the glasses in refrigerator (or in a cool place, if ice is not available) and permit them to stand quietly for several hours or preferably overnight. By observing and comparing the strengths of the various gelatins after setting is established, the relative values are readily determined; the strongest gelatin is more efficient in its work, and it is the most economical because a smaller quantity is necessary to produce a required result. And it generally follows that the purest gelatin is the strongest.

At the factory in Grayslake, Illinois, there is a well equipped laboratory with an experienced staff for testing and research in the specific problems involved in the use of gelatin.

Tests

This service is readily available on inquiry or application to the

GRAYSLAKE GELATIN CO.,
GRAYSLAKE, ILLINOIS

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